Standard Lab 06
Microscope

Operating Instructions

G 41-117-e

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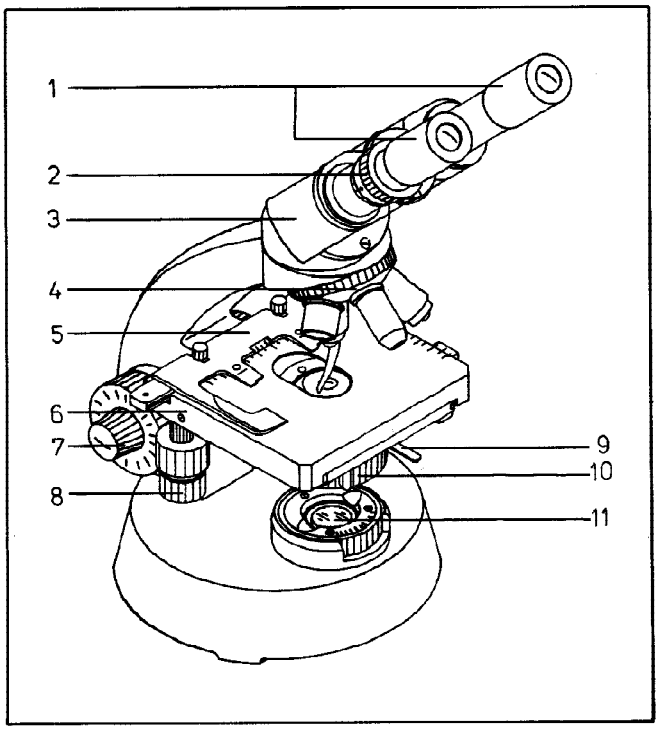
- Specifications subject to change.
- The 6 to 10-digit figures are order numbers and are in some cases marked on the components.

Standard LAB 06 microscope for examinations in brightfield, phase contrast, darkfield and polarized light

1 Cpl wide-angle eyepieces 10/18 Br[1] (46 40 22-9902)
2 Adjustable eyepiece tube
3 Binocular tube D 1 with 45° viewing angle and tube factor 1 (for max. field-of-view number 20)
4 Revolving nosepiece with 4 objectives
5 Specimen holder 50
6 Mechanical stage 05, graduated, 25 x75 mm motion range
7 Coarse and fine focusing controls to adjust image sharpness. The total vertical displacement of the stage is 25 mm.
8 Low-mounted coaxial control for specimen displacement
9 Vertical adjustment of condenser
10 Vertically adjustable condenser 0.9 SAS with turret for brightfield and phase contrast with phase stop 2; can be retrofitted for darkfield with numerical apertures up to 0.65 corresponding to objectives up to 40x magnification or objectives Ph 1 and Ph 3
11 Centerable luminous field diaphragm; on top, holder for 32 mm dia. filters
12 Knurled screw to fix tube[2]
13 Brightness control of halogen lamp
14 Stand base with built-in transformer

1



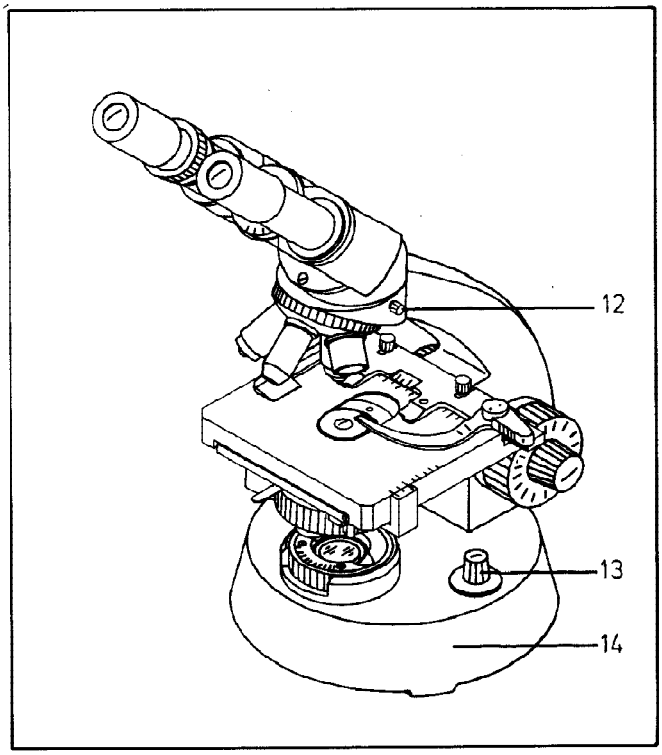
Check mains voltage before connecting instrument!
The type plate on the underside of the instrument indicates whether the built-in power supply is rated for the available mains voltage.

a) For mains voltage 220 ... 240 V
Built-in transformer 220 V/6 V 10 W, 50 ... 60 Hz (cps), 18 VA
Mains cable with CEE plug (39 25 75-9101)
Stand equipment for 220-240 V (47 09 50)
meets VDE regulations

b) For mains voltage 110 ... 127 V
Built-in transformer 120 V/6 V 10 W, 50 ... 60 Hz (cps), 18 VA
Mains cable with U.S. plug (39 25 75-9104)
Stand equipment for 120 V (47 09 51)
UL listed

Remove red transport lock before operating focusing controls.

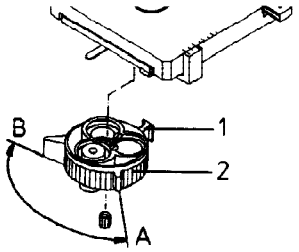
2



1) Eyepiece for spectacle wearers. Non-spectacle wearers should view with rubber eyecups (46 49 30)

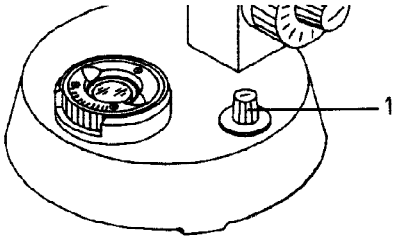
2) For use of epi-fluorescence condenser IV FI on stand LAB 06 replace the knurled cap by the cap (47 73 05-0120).

With the basic equipment work can be done in brightfield and phase contrast with phase stop 2. Turret (2) of condenser 0.9 SAS can be switched to 3 click-stop positions. Three orienting lugs (1) on the turret outer edge indicate these positions.
Turning the condenser turret serves two functions:
1. Switching to stop positions
2. Operating the contrast aperture diaphragm.
We urgently recommend switching in arrow direction A (clockwise), since in this case the aperture diaphragm is always open. If necessary, the aperture diaphragm can be closed by turning in opposite direction B (counterclockwise).

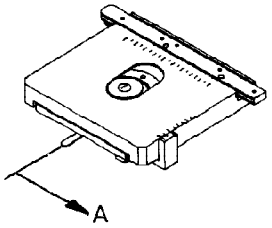


Adjusting for brightfield

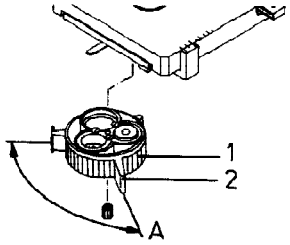
1. Connect to mains with mains cable checking mains voltage; control brightness with knob (1). Place specimen on stage.



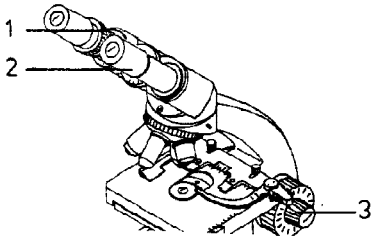
2. Rack up condenser as far as it will go by moving lever in arrow direction A (clockwise).



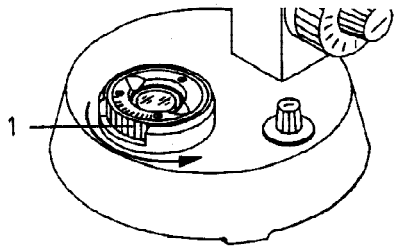
3. Turn condenser turret (1) in arrow direction A (clockwise) to click-stop position with long orienting lug (2) on front right.
For low-power observation with objectives $\leqq$ 10 the turret should be in click-stop position with short orienting lug on front right. In this position the luminous field diaphragm in the microscope base serves as contrast aperture.



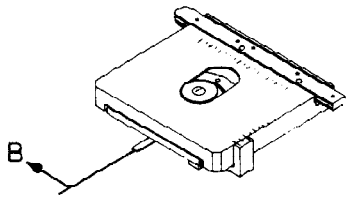
4. Using objective 10 (or higher) focus specimen with control (3) while looking through right eyepiece (2).
Correct image sharpness for left eye by turning in adjustable eyepiece tube (1).
Adjust distance of the two eyepiece tubes until a circular, sharply defined field of view is seen with both eyes.

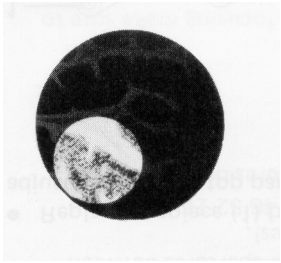


5. While viewing slightly close down luminous field diaphragm (1) in microscope base. Diaphragm edge becomes visible.

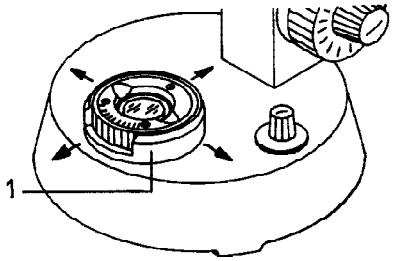


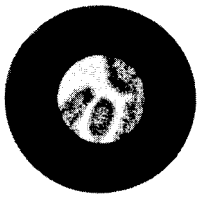
6. Slightly lower condenser:
Lever in arrow direction B (counterclockwise) until diaphragm edge is in focus.



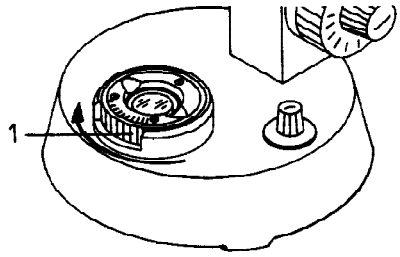


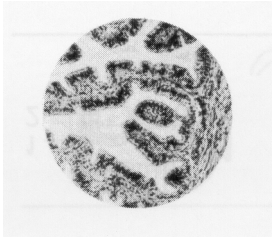
7. Center luminous field diaphragm in field of view by shifting mount of diaphragm insert (1) with both thumbs and forefingers.



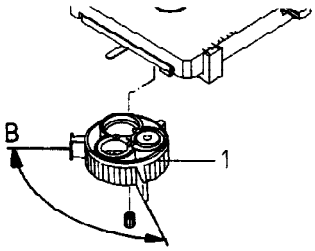


8. Open luminous field diaphragm (1) to clear entire field of view.

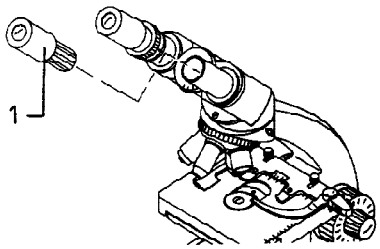




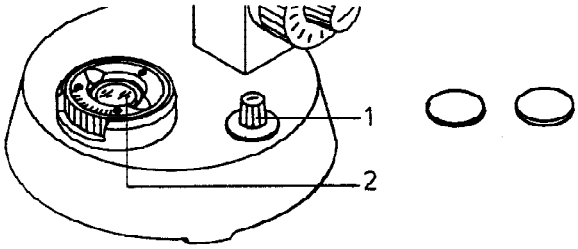
9. Use aperture diaphragm to control image contrast: turn turret (1) in arrow direction B (counterclockwise).



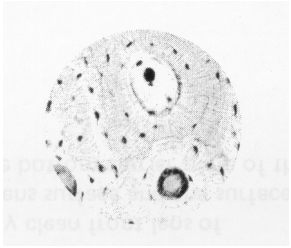
10. Check: remove eyepiece (1) and look through tube. Three quarters of visible objective aperture should be filled with light.



11. Adjust image brightness with lamp control (1) or with filters in holder (2).



After changing objectives: Just adapt luminous field diaphragm to size of visual field and adjust aperture diaphragm to obtain optimum contrast.

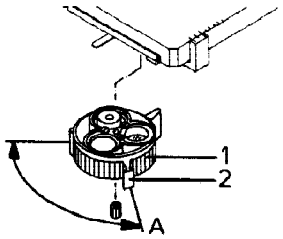


Note for work with immersion objectives,
e.g. Achromat 100/1.25 oil
Always apply drop of immersion oil between objective front lens and specimen. We supply special immersion oil in an oiler which guarantees optimum performance of the objective. In applying immersion oil make sure to avoid air bubbles between specimen and objective front lens; otherwise the image quality will be poorer. In retracted position the objective mount can be engaged by slightly turning it; in this way the immersion objective can be swung in and out without touching a non-immersed cover glass (avoiding contamination of the front lens of dry objectives).
Do not immerse condenser front lens!

Adjusting for phase contrast (Ph 2)

1 – 8 Adjustment as for brightfield

9. Turn condenser turret (1) in arrow direction A (clockwise) to stop position with marked orienting lug (2) on front right. The aperture diaphragm is now open.
(Phase stop Ph 2 now in the beam path is factory-aligned for the objective 40 Ph 2 in the basic microscope equipment supplied by us.)

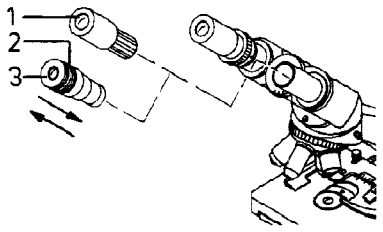


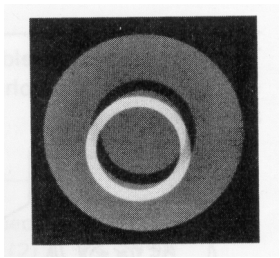
10. Use matching Ph 2 objective with phase ring Ph 2.

Note
Good phase contrast requires absolute cleanliness! To remove any grease thoroughly clean front lens of objective, visible condenser lens surface and the surfaces of the top cover glass and the bottom carrier plate of the specimen.

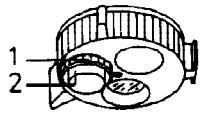
Subsequent insertion [1] of a phase stop requires the following additional adjustments:

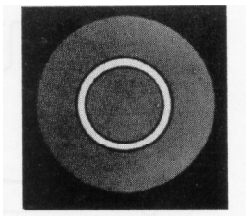
- Replace eyepiece (1) by centering telescope (2) and by adjusting its black top part (3) focus the Ph rings.





- Bring phase annulus and annular stop to coincidence by tilting mount of phase stop (2) with knurled ring (1).
(Knurled ring should not be too tight for this; then tighten knurled ring and check adjustment; repeat, if necessary.)





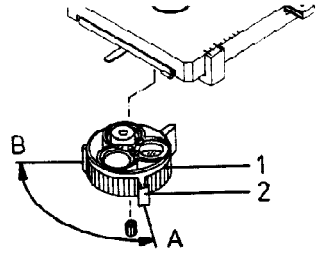
- Replace eyepiece.
If necessary, place green filter VG 9 (46 78 05) in filter holder on luminous field diaphragm.
- After changing objectives: Just adapt luminous field diaphragm to size of visual field and insert phase stop matching objective into condenser turret.

[1] Inserting phase rings is described on page 9.

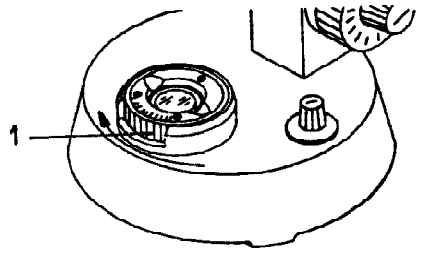
Adjusting for darkfield
Requirement:
Darkfield diaphragm inserted in condenser turret as described on page 9. Darkfield diaphragm A 0.7 (darkfield/SAS attachment 46 52 27) for objective apertures between 0.3 and 0.65 (for 25x and 40x objectives).
Phase stop Ph 3 (Ph 3/SAS attachment 46 52 26) as darkfield diaphragm for objective apertures below 0.4 (for 10x and 16x objectives).

1 – 8 Adjustment as for brightfield. In focusing make sure to select a specimen feature showing little structure (if necessary, an area at the edge of the specimen).

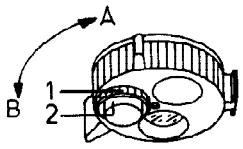
9 Turn condenser turret (1) in arrow direction A (clockwise) to stop position with orienting lug (2) for darkfield diaphragm on front right (aperture diaphragm is open).



10 Open luminous field diaphragm (1).

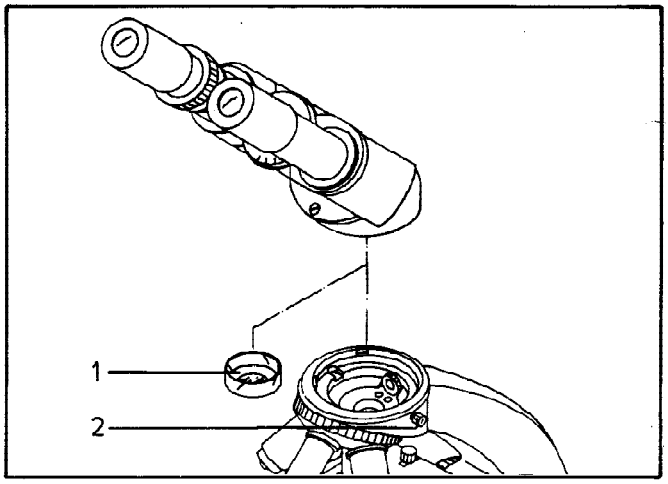


11 Remove one eyepiece. Center darkfield diaphragm through tube without eyepiece by tilting diaphragm mount (2); knurled ring (1) should not be too tight. In gradually closing the aperture diaphragm (turning condenser turret in arrow direction B (counterclockwise)) the residual light visible in the back objective aperture should be extinguished from all sides as uniformly as possible.
Tighten knurled ring (1) and fully open aperture diaphragm (turning condenser turret in arrow direction A, clockwise to stop). Replace eyepiece.
To enhance contrast:
a) Adjust maximum brightness
b) Slightly close down luminous field diaphragm
c) Optimize vertical adjustment of condenser.



Note
Good darkfield requires absolute cleanliness. To remove any grease thoroughly clean front lens of objective, visible condenser lens surface and the surfaces of the top cover glass and the bottom carrier plate of the specimen.

3



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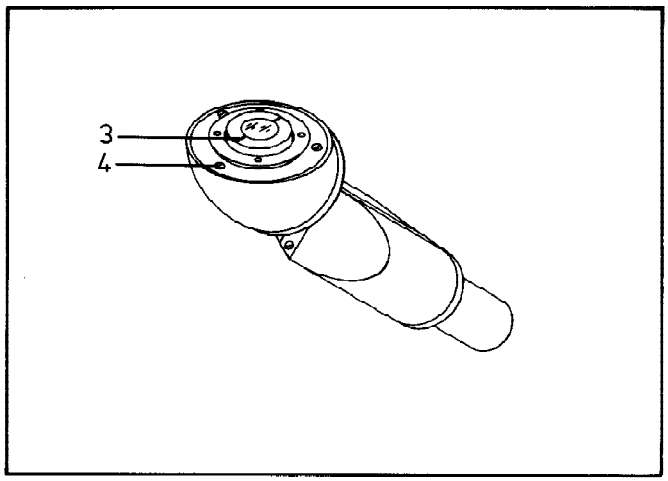

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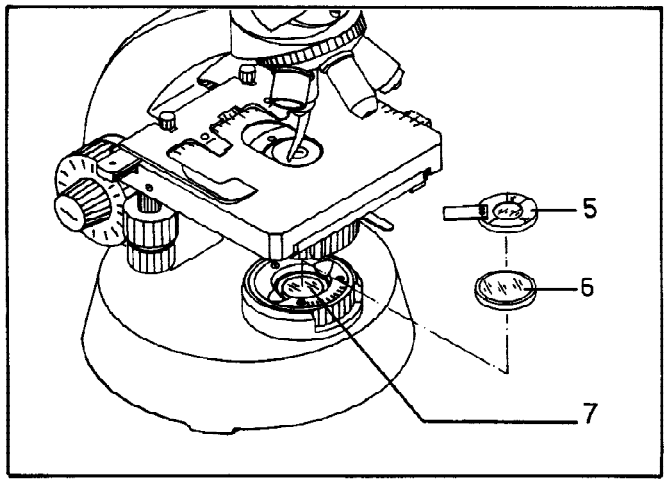


Adjusting for polarized light

Equipment for simple examinations in polarized light (orthoscopic examinations).
Inserting analyzer (47 36 57) (1) in binocular tube D 1.
Loosen knurled screw (2) and take off the binocular tube.
Place analyzer in holder on binocular tube. Two white index lines indicate the oscillation direction of the analyzer. With attached tube it should be North-South (vertical), i.e. at right angles to that of the polarizer (screw (4) serves as aid in orienting the analyzer).
Replace binocular tube.

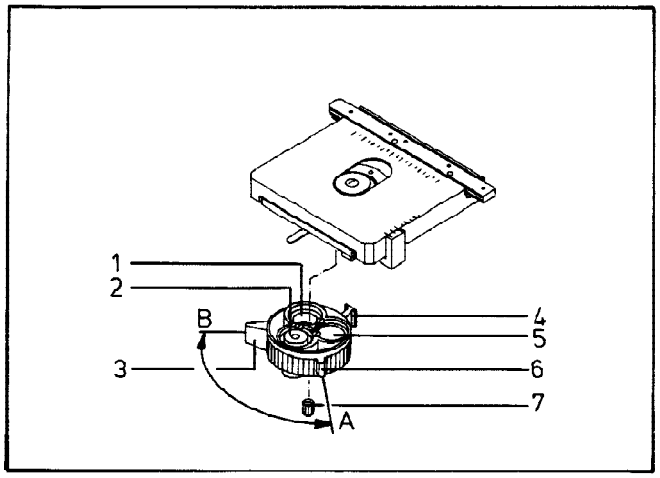
Place polarizing filter (47 36 00) (6) in opening (7) above the luminous field diaphragm. The two white index lines on the mount of the polarizer (6) indicate the oscillation direction and should lie in East-West direction (horizontal).

For exact cross position slightly turn polarizer until the field-of-view background shows maximum extinction.

Focusing the specimen in polarized light:
Adjust as for brightfield on page 4,
also
cross polarizers, and
close down aperture diaphragm slightly more than for brightfield.

To use the auxiliary object first order red, 32 mm dia. (47 37 01), place it on the polarizer. The direction is North-East to South-West.

6



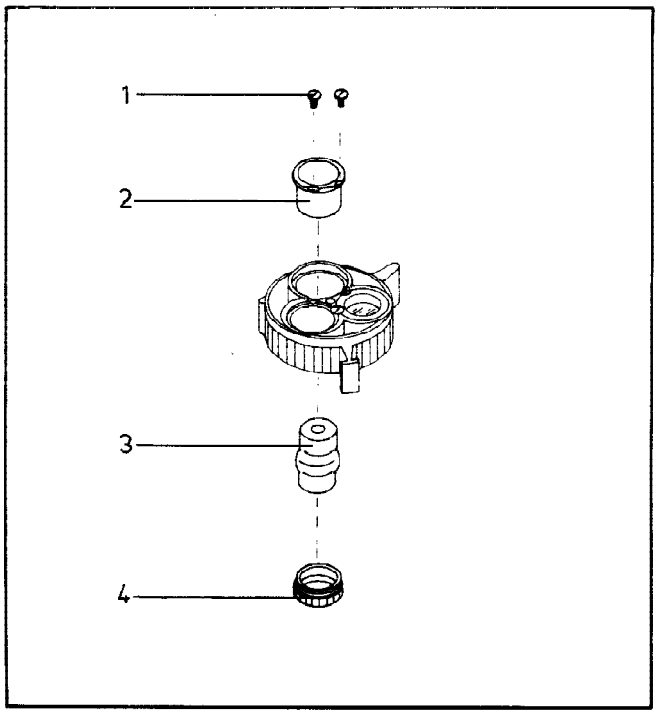
Condenser 0.9/SAS assembly
Loosen knurled nut (7) and pull condenser turret down and out. This part of the condenser holds the various inserts for brightfield, phase contrast (Ph 1, Ph 2, Ph 3), and darkfield. Arrangement in normal position: turning the turret in arrow direction A, the inserts opposite the orienting lugs can be used in the following sequence:

Short orienting lug (6) –
mount with auxiliary lens (1) for objectives ≤ 10

Long orienting lug (3) –
clear passage (5) for objective > 10

Marked orienting lug (4) – Ph 2 insert (2)

7



Exchange of inserts in condenser 0.9/SAS
Taking out Ph 1, Ph 2, Ph 3 and darkfield inserts:
Loosen knurled ring (4).
Pull mount (3) with phase stop attached on top down and out.
Loosen 2 screws (1) in notches of mount (2) and pull out mount.
Taking out auxiliary lens insert:
Loosen screws (1) and pull out insert.

The inserts are mounted in reverse order.

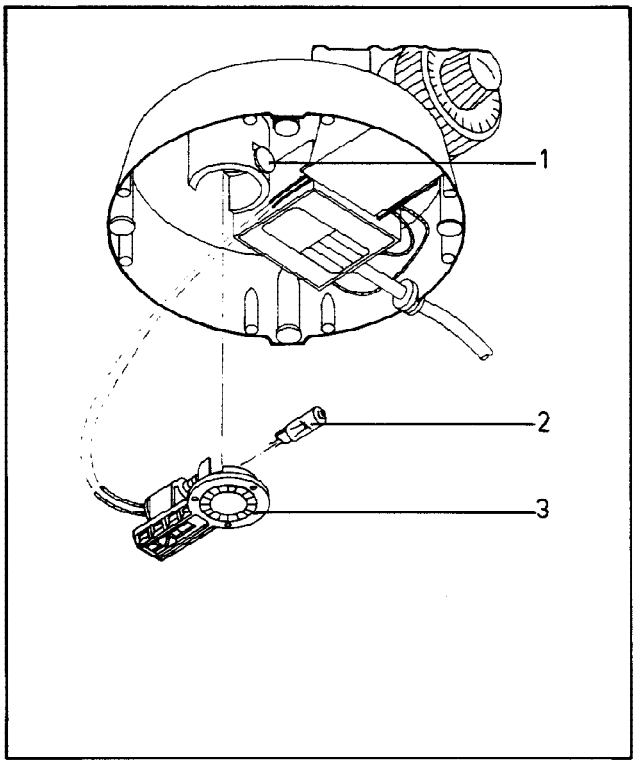
Condenser 0.9/SAS and attachments	**Cat. No.**
Condenser 0.9/SAS, basic equipment to change between brightfield and phase contrast Ph 2, containing:	46 52 10-9901
Auxiliary lens insert	46 52 10-8023
Insert with phase stop Ph 2	46 52 10-8030
Attachments for condenser 0.9/SAS:	
Ph 1/SAS attachment	46 52 25
Ph 3/SAS attachment	46 52 26
Darkfield/SAS attachment	46 52 27

Exchange and adjustment of halogen lamp

To change 6 V 10 W halogen lamp (38 61 08):
Lay the microscope on its side. Loosen knurled screw (1) and pull out lamp socket (3).
Remove lamp from the two metal clips. Holding the new lamp in the plastic cover in which it is supplied, insert lamp into socket. Take off plastic cover. Wipe off finger marks to prevent burning in.

To adjust halogen lamp:
When optically adjusted, the filament and its reflection must be parallel and match in size (looking at lamp (6) and concave mirror (7)).
To achieve this, loosen screw (4) and shift halogen lamp parallel to lamp socket to obtain setting (5). Tighten screw (4).
Now turn screw (8) until filament and reflection are the same size (9).
After completing adjustment, insert lamp housing and screw down with knurled screw (1).

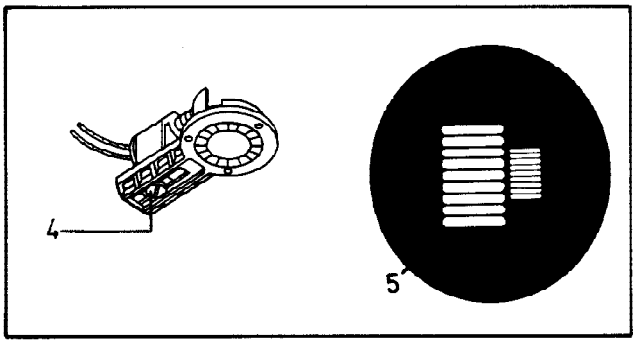
8



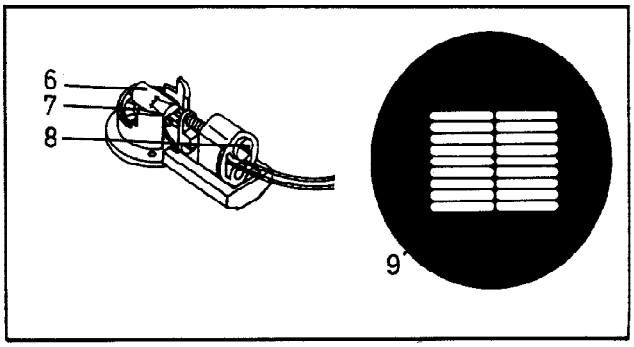
Note
The halogen lamp is a light source of high luminance.
Comparison:

Lamp	Luminance cd/cm^2
6 V 15 W filament lamp	850
6 V 10 W halogen lamp	1700
12 V 60 W filament lamp	1250

9



10



Other accessories

Centering telescope for phase contrast	46 48 22-9903
Microscope case	47 94 68
Dust cover	47 93 00
Conversion filter CB 12 (32x2 mm)	46 78 50-9901
Green filter VG 9 (32x3 mm)	46 78 05

Spare parts:

6 V 10 W halogen lamp	38 61 08

Total magnification of the microscope

The magnification of the microscope results from the following multiplication:

$M_M = M_{obj} \times M_{eyepiece}$

Example:

400 = 40 x 10

M_M = Microscope magnification

M_{obj} = Objective magnification

$M_{eyepiece}$ = Eyepiece magnification

Literature:

F. K. Möllring: Microscopy from the very beginning,
G 41-100/V-e